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Hydrology and Earth System Sciences Discussions

Interactive comment on "Hydrological impact of rainwater harvesting in the Modder river basin of central South Africa" *by* W. A. Welderufael et al.

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Dear Authors,

First of all I want to complement you on submitting a paper on such an important and relevant issue as rainwater harvesting for small scale supplementary irrigation. This research is highly relevant for the development of Sub-Saharan Africa in particular.

As editor in chief, I regularly monitor the papers that appear in HESSD and without wanting to enter into the details of your paper, two things occur to me which I feel are important to highlight. One is about the correct use of units, the other is about a proper reference to the scientific literature.

I noticed that you express all the hydrological fluxes in mm, whereas a flux is always a depth per unit of time [L/T]. It is a general rule in HESS that fluxes are expressed with the dimension [L/T] or [L^3/T], whereas stocks are expressed as a depth [L] or a volume [L^3]. Even if fluxes are accumulated, then they have been accumulated over a certain period of time, which needs to be reflected in the denominator. Accumulated rainfall over a year does not make it a stock. It remains a flux. Often people say: the annual rainfall is 200 mm. This may be correct in a colloquial sense, but the unit should be mm/year and not mm. It is the same mistake as one makes by saying: "my hourly speed is 40 km". Although it may be clear what people mean, the unit is wrong. Inversely if people say the daily temperature is 20 degrees Celcius, this does not mean that it is 20 °C/day. Mentioning the time frame does not imply that this same time frame is reflected in the unit. For instance, it is perfectly correct to say that the mean annual discharge of a river is 100 m^3/s. In science, units should be correct. I have seen too often errors made because of a disregard of the proper units. Please use correct units in the text, the tables and the graphs (Figures 5 and 6).

Second, I noticed that you cite a lot of 'grey' literature. Grey literature may only be referred to if there is no alternative from the formal literature. In your case there are many references to informal literature that can be removed. In addition, I can't help but notice that you missed a large part of the formal literature. This is not proper practice. Below I list a number of papers on the subject of rainwater harvesting in rainfed agriculture in Sub-Saharan Africa in which I was involved myself. But then there are likely to be more. I suggest you do a proper literature search and make use of these references in your final paper.

Suggested literature:

Makurira, H., H.H.G. Savenije, S. Uhlenbrook, 2010. Modelling field scale water partitioning using on-site observations in sub-Saharan rainfed agriculture. Hydrology and Earth System Sciences, 14, 627-638.

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Makurira, H., H.H.G. Savenije, S. Uhlenbrook, J. Rockström, A. Senzanje, 2009. Investigating the water balance of on-farm techniques for improved crop productivity in rainfed systems: A case study of Makanya catchment, Tanzania. Physics and Chemistry of the Earth, 34, 93-98.

Makurira, H., H.H.G. Savenije, S. Uhlenbrook, J. Rockström, A. Senzanje, 2007. Towards a better understanding of water partitioning processes for improved smallholder rainfed agricultural systems: A case study of Makanya catchment, Tanzania. Physics and Chemistry of the Earth 32 (2007) 1082–1089.

Ngigi, S.N., Savenije, H.H.G., Gichuki, F.N., 2008. Hydrological impacts of flood storage and management on irrigation water abstractions in upper Ewaso Ng'iro river basin, Kenya. Water Resources Management, doi: 10.1007/s11269-008-9257-5; 1-21.

Makurira, H., M.L. Mul, N.F. Vyagusa, S. Uhlenbrook, H.H.G. Savenije, 2007. Evaluation of community-driven smallholder irrigation in dryland South Pare Mountains, Tanzania: A case study of Manoo micro dam. Physics and Chemistry of the Earth 32, pp. 1090–1097.

Ngigi, Stephen N., Hubert H.G. Savenije and Francis N. Gichuki, 2007. Land use changes and hydrological impacts related to up-scaling of rainwater harvesting and management in upper Ewaso Ng'iro river basin, Kenya. Land Use Policy, 24: 129-140.

Ngigi , Stephen N., Johan Rockström and Hubert H.G. Savenije, 2006. Assessment of rainwater retention in agricultural land and crop yield increase due to conservation tillage in Ewaso Ng'iro river basin, Kenya. Physics and Chemistry of the Earth, Vol 31: 910-918.

Ngigi, Stephen, N., Hubert H.G. Savenije, Johan Rockström, Charles K. Gachene, 2005. Hydro-economic evaluation of rainwater harvesting and management technologies: Farmers' investment options and risks in semi-arid Laikipia district of Kenya.

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Physics and Chemistry of the Earth, 30: 772-782.

Ngigi, Stephen N., Hubert H.G. Savenije, Josephine N. Thome, Johan Rockström and F.W.T.Penning de Vries, 2005. Agro-hydrological evaluation of on-farm rainwater storage systems for supplemental irrigation in Laikipia district, Kenya. Agricultural Water Management, 73: 21-41.

Rockström, J., Folke, C., Gordon, L., Hatibu, N., Jewitt, G., de Vries, F.P., Rwehumbiza, F., Sally, H., Savenije, H., Schulze, R., 2004. A watershed approach to upgrade rainfed agriculture in water scarce regions through Water System Innovations: an integrated research initiative on water for food and rural livelihoods in balance with ecosystem functions. Physics and Chemistry of the Earth, 29 (15-18): 1109-1118.

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., 8, 5051, 2011.